

NATIONAL TRANSPORTATION SAFETY BOARD
Vehicle Recorder Division
Washington, D.C. 20594

January 4, 2015

Cockpit Voice Recorder

Group Chairman's Factual Report

1. EVENT

Location: Bagram, Afghanistan
Date: 04/29/2013
Aircraft: Boeing 747-400, N949CA
Operator: National Air Cargo
NTSB Number: DCA13MA081

2. GROUP

Chairman: Douglass P. Brazy
Mechanical Engineer
National Transportation Safety Board

Member: Tom Littleton
Chief Air Safety Investigator
AVP-100 Division Manager
Federal Aviation Administration

Member: Carl V. Barnes
Training Development Specialist
National Airlines

Member: Captain Sam Goodwell
Safety Pilot
Flight Technical & Safety Flight Services
The Boeing Company

3. SUMMARY

On April 29, 2013, about 1527 local time, a B747-400, N949CA, operated as National Airlines flight 102, crashed shortly after takeoff from Bagram Air Base (OAIX), Bagram, Afghanistan. All seven crewmembers onboard were fatally injured and the airplane was destroyed from impact forces and post-crash fire. The 14 Code of Federal Regulations (CFR) Part 121 Supplemental cargo flight was destined for Dubai World Central - Al Maktoum International Airport (OMDW), United Arab Emirates.

A solid-state cockpit voice recorder (CVR) Crash Survivable Memory Unit was sent to the National Transportation Safety Board's Audio Laboratory for readout. The CVR Group meeting convened on May 6, 2013 and a partial transcript was prepared for the 2-hour, 5-minute duration digital recording (see attached).

4. DETAILS OF INVESTIGATION

On May 4, 2013 the following CVR Crash Survivable Memory Unit (CSMU) was delivered to the NTSB Vehicle Recorder Division's Audio Laboratory:

Recorder Manufacturer/Model: **Honeywell 980-6022**
Recorder Serial Number: **9713 (CSMU Assembly Only)**

4.1. Recorder Description

Multi-Engine turbine powered aircraft operating under 14 CFR Part 121 must be equipped with a 2-hour duration CVR. The CVR records audio in a digital format, and is active whenever electrical power is available. The CVR memory will retain the audio from the most recent 2 hours of CVR operation, which may or may not be continuous. The recorded audio data is separated by the Honeywell download software into 2 sets of audio files: a) a 2-channel recording containing the last 2 hours of audio, and b) a 4-channel recording containing the last 30 minutes of audio. The 2-hour portion contains one channel of audio information from the cockpit area microphone (CAM) and the other channel contains a mixture of three audio sources: the Captain's audio panel, the First Officer's audio panel, and the spare channel which may be used to capture a third pilot station or observer station and/or the Public Address system. The 30-minute portion of the recording contains 4 channels of audio data, one channel for each of these 4 sources.

4.2. Recorder Damage

Upon arrival at the audio laboratory, it was evident that the CVR had sustained some minor thermal damage and sooting, as well as some superficial mechanical damage. See Figure 1.



Figure 1 – Honeywell CSMU

The “flex cable” which connects the CSMU to the recorder chassis was severed and had slight thermal damage (this type of damage is typical and does not affect the memory). See Figure 2.



Figure 2 - Flex Cable Damage

Upon disassembly, the internal circuit cards and memory chips were found undamaged. See Figure 3 and Figure 4.

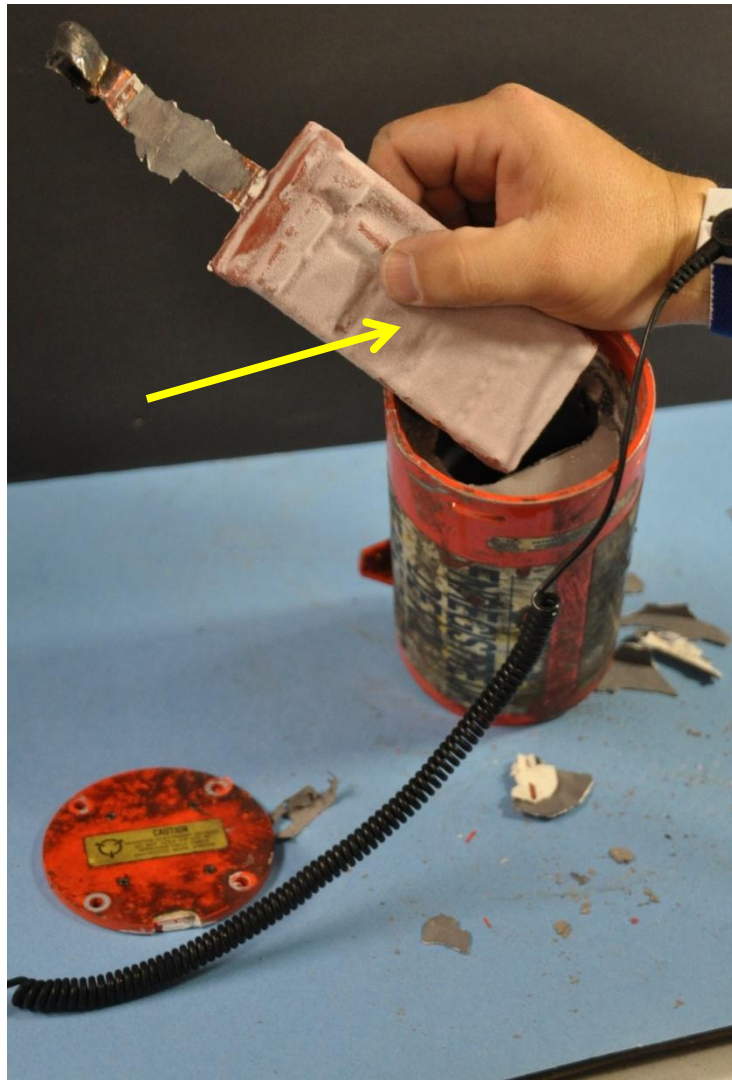


Figure 3 - Disassembly

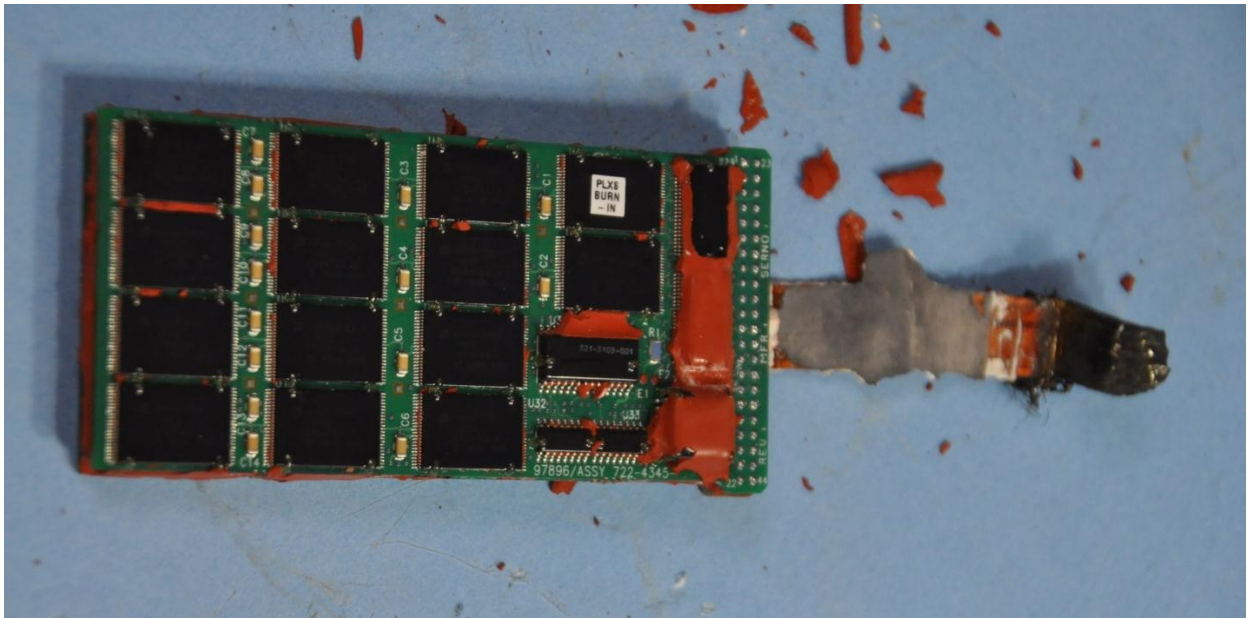


Figure 4 - Circuit Cards and Memory Chips

The temperature indicating label on the circuit card had not been activated, meaning the temperature of the card had not reached 300 degrees F (149 degrees C). See Figure 5.

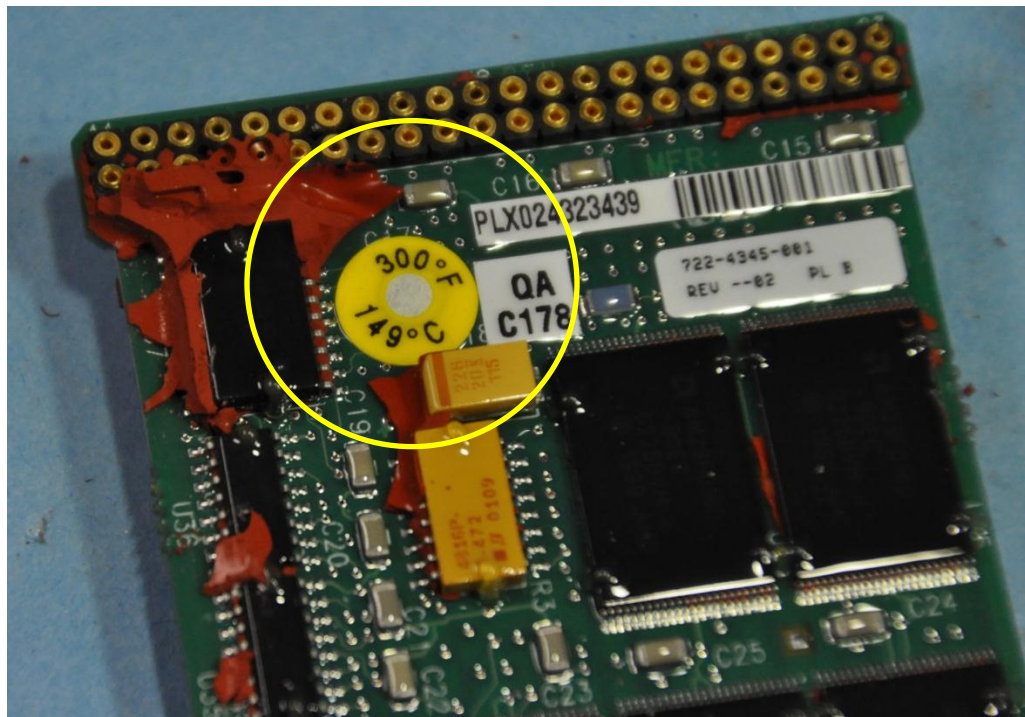


Figure 5 - Temperature Indicating Label

4.3. Audio Recording Quality

The CVR recording consisted of four separate channels of audio information. Each channel's audio quality is indicated in the table below.

| Channel Number | Content/Source | Quality |
|----------------|---------------------------|-----------|
| 1 | Captain Audio Panel | Excellent |
| 2 | First Officer Audio Panel | Good |
| 3 | Spare | Excellent |
| 4 | Cockpit Area Microphone | Excellent |

This model recorder stores the audio data in two ways: Channels 1 through 3 were stored individually in separate files, for the last 30 minutes of the CVR recording, as noted in the table above. These three channels were also stored mixed together into a separate single file, for the full two hour duration of the CVR recording. Channel 4 was stored only once, in a single 2 hour duration file.

On this recording, the spare channel captured the same audio as the First Officer's audio panel channel.

4.4. Timing and Correlation

Timestamps in the attached transcript reflect Coordinated Universal Time (UTC), which is also commonly referred to as "GMT"¹. The CVR elapsed time² was offset by adding 8 hours, 51 minutes, and 9 seconds to synchronize the radio transmissions as heard on the CVR with the times in the Air Traffic Control transcript obtained by the Operational Factors Group. The UTC timing of events on the CVR were correlated to corresponding events on the flight data recorder to establish a common time base for the two recorders.

4.5. Description of Recording

The CVR captured the descent and landing of the previous flight, segments while the aircraft was on the ground, and the accident flight takeoff. Select discussions following the landing and in preparation for the accident flight were transcribed and are included in the attached partial transcript. Areas of the CVR not transcribed are noted with the phrase 'break in transcript'. The accident flight had two Captains and two First Officers on board. The flight crew members, not flying during the accident flight, are referred to as the second Captain and the second First Officer.

¹ Greenwich Mean Time (GMT). The Flight Data Recorder Factual Report for this investigation uses this nomenclature.

² CVR Elapsed Time is the running time of the CVR recording where 0:00:00 is the start (earliest portion) of the entire recording.

In addition to the attached partial transcript, the CVR group made the following observations of the recording contents:

The CVR recording began when the airplane was at about 23,000 feet on descent into Bagram. During the landing rollout after the flight into Bagram, there was a brake over temperature event. The crew ran a checklist in response to the event. They discussed the required brake cooling wait time, (about 1 to 1.5 hours), as well as the deceleration technique that was used on the landing. The crew noted that they had used the autobrake initially and had transitioned to manual braking, and discussed how they had used the thrust reversers. The crew monitored the brake temperatures which are displayed in the cockpit as “levels” ranging from 0-9. Some of the temperature indications were amber colored (“high”) initially, and then subsequently changed to white (“normal”) about one hour after the airplane was parked.

There was a discussion about the brake pads having been worn to the “nubs” and they would need replacing (one of the crew members was recounting this from a pre-flight inspection or “walk-around”). There was also a discussion about what would be required if the brake temperature indications were to have occurred while inflight. The crew discussed a checklist item for this condition which describes putting the gear down for a period of time in response to elevated brake temperatures. The crew discussed whether or not they should delay the gear retraction on the next (what would be the accident) takeoff to aid in the brake cooling, and they discussed leaving the gear synoptic page up to monitor the temperatures. They also discussed the possibility of modifying the takeoff procedure such as using full T/O (max thrust takeoff) and using the best angle of climb plus twenty five knots on the climbout. They discussed programming the FMC to do this (The second Captain was providing this guidance to the accident flight’s Captain and First Officer).

Also while on the ground at Bagram, there was a discussion concerning cargo movement that occurred sometime during the flight into Bagram. The crew discussed a broken strap and the presence of a “knot” was mentioned. The crew further discussed some straps that had loosened and a load movement of “a couple inches”. The accident Captain commented about heavy cargo not having a “lock”. The issue was ultimately addressed by replacing the broken item and “cinching them all down” and perhaps adding some additional straps.

The crew briefed the Mode Control Panel settings as:

167 (knots – the V_2 speed)
027 (degrees - runway heading)
5000 (feet – altitude)

The takeoff speeds were briefed as:

140 (knots, V_1)

153 (knots, V_R)
167 (knots, V_2)

The trim settings were briefed as:

3.8 (units, pitch trim)
0 (units, roll trim)
0 (units, yaw trim)

The CVR recording ended prematurely, approximately 9 seconds after the crew's callout to rotate the airplane for takeoff.

The attached partial transcript begins at 09:57:33 UTC while the airplane is on the ground at Bagram prior to the accident takeoff.

Doug Brazy
Vehicle Recorder Division

Attachment I – CVR Quality Rating Scale

The levels of recording quality are characterized by the following traits of the cockpit voice recorder information:

| | |
|--------------------------|---|
| Excellent Quality | Virtually all of the crew conversations could be accurately and easily understood. The transcript that was developed may indicate only one or two words that were not intelligible. Any loss in the transcript is usually attributed to simultaneous cockpit/radio transmissions that obscure each other. |
| Good Quality | Most of the crew conversations could be accurately and easily understood. The transcript that was developed may indicate several words or phrases that were not intelligible. Any loss in the transcript can be attributed to minor technical deficiencies or momentary dropouts in the recording system or to a large number of simultaneous cockpit/radio transmissions that obscure each other. |
| Fair Quality | The majority of the crew conversations were intelligible. The transcript that was developed may indicate passages where conversations were unintelligible or fragmented. This type of recording is usually caused by cockpit noise that obscures portions of the voice signals or by a minor electrical or mechanical failure of the CVR system that distorts or obscures the audio information. |
| Poor Quality | Extraordinary means had to be used to make some of the crew conversations intelligible. The transcript that was developed may indicate fragmented phrases and conversations and may indicate extensive passages where conversations were missing or unintelligible. This type of recording is usually caused by a combination of a high cockpit noise level with a low voice signal (poor signal-to-noise ratio) or by a mechanical or electrical failure of the CVR system that severely distorts or obscures the audio information. |
| Unusable | Crew conversations may be discerned, but neither ordinary nor extraordinary means made it possible to develop a meaningful transcript of the conversations. This type of recording is usually caused by an almost total mechanical or electrical failure of the CVR system. |

Attachment II - Transcript of a Honeywell model 980-6022 solid-state cockpit voice recorder, serial number 9713 (CSMU assembly), which was installed on a National Airlines Boeing 747-400 (N949CA), which crashed during takeoff from Bagram Air Base, Afghanistan on April 29, 2013.

LEGEND

| | |
|------------|---|
| CAM | Cockpit area microphone voice or sound source |
| HOT | Flight crew audio panel voice or sound source |
| RDO | Radio transmissions from N949CA |
| GND | Radio transmission from the Bagram ground controller |
| TWR | Radio transmission from the Bagram airport tower controller |
| AWS | Aural Warning System |

For CAM, HOT and RDO comments:

| | |
|------------|---|
| -1 | Voice identified as the Captain |
| -2 | Voice identified as the First Officer |
| -3 | Voice identified as the Additional Crew Member (second Captain) |
| -4 | Voice identified as the Loadmaster |
| -5 | Voice identified as the Mechanic |
| @ | Third party name |
| -? | Voice unidentified |
| * | Unintelligible word |
| # | Expletive |
| () | Questionable insertion |
| [] | Editorial insertion |

Note 1: Times are expressed in UTC.

Note 2: Generally, only radio transmissions to and from the accident aircraft were transcribed.

Note 3: Words shown with excess vowels, letters, or drawn out syllables are a phonetic representation of the words as spoken.

Note 4: A non-pertinent word, where noted, refers to a word not directly related to the operation, control or condition of the aircraft.

TIME and
SOURCE

INTRA-COCKPIT COMMUNICATION
CONTENT

TIME and
SOURCE

AIR-GROUND COMMUNICATION

08:51:09

[start of recording]

09:57:23

[Start of Transcript]

09:57:33

CAM-2 there's your trouble Brad.

09:57:35

CAM-1 what is it?

09:57:37

CAM-1 what the # was that from?

09:57:39

CAM-2 one of those # straps is busted.

09:57:42

CAM-3 * * tire.

09:57:44

CAM-1 no no, I know that... * no I know, but....

09:57:45

CAM-2 give you one guess what was right there.

09:57:49

CAM-1 what was right where?

09:57:49

CAM-2 right here.

09:57:50

CAM-1 a knot?

09:57:51

CAM-2 uh huh.

09:57:52

CAM-1 that was the one right at the door?

**TIME and
SOURCE**

**INTRA-COCKPIT COMMUNICATION
CONTENT**

**TIME and
SOURCE**

AIR-GROUND COMMUNICATION

09:57:54
CAM-2 no... this was at.... * *.

09:57:56
CAM-1 so you (go on/go in) puttin more straps (on #)?

09:57:59
CAM-2 (well) it just shifted (apparently/barely).

09:58:01
CAM-3 there was a bunch of them first... that first (truck).

09:58:02
CAM-1 did it move? # moved?

09:58:04
CAM-2 yes. just tightened up on the straps.

09:58:06
CAM-2 the truck?

09:58:06
CAM-3 * like.... tightened those straps up uh, quite a bit, on the first one.

09:58:13
CAM-2 you know how that...well you go look at the.... went and looked at them now... all the ones * they had a bunch like this, to keep them from movin backwards...a bunch like this * * movin forward? all the ones that were keepin em from movin backwards were all # loose.

09:58:28
CAM-3 what the # do you think's gonna happen when you # slam it on the runway and slam on the # brakes and don't use reverse... [said in a joking manner]

09:58:35
CAM-1 [sound of laughter]

**TIME and
SOURCE**

**INTRA-COCKPIT COMMUNICATION
CONTENT**

**TIME and
SOURCE**

AIR-GROUND COMMUNICATION

09:58:36
CAM-2 there ain't nothin you coulda done about that.

09:58:37
CAM-3 * * I'm putting it on the # # board I'm gettin off this plane, I'm scared. [said in a joking manner]

09:58:43
CAM-? * * .

09:58:46
CAM-1 thow that out man, that's evidence. * @ [the loadmaster] don't want that hangin around either.

09:58:50
CAM-? no.

09:58:53
CAM-1 I hope instead of * rather than just replacing that (strap) I hope he's beefing the straps up more.

09:58:59
CAM-? just on that one spot.

09:59:00
CAM-2 yeah.

09:59:02
CAM-? all the rest of them are fine.

09:59:06
CAM-2 he's cinching them all down.

10:14:49
CAM [break in transcript]

10:14:57
CAM-1 what's up, dude?

10:15:01
CAM-2 did you throw that other strap away?

**TIME and
SOURCE**

**INTRA-COCKPIT COMMUNICATION
CONTENT**

**TIME and
SOURCE**

AIR-GROUND COMMUNICATION

10:15:04
CAM-1 what did you - did you put a couple more on?

10:15:11
CAM-1 how far did it move.... a couple of inches?

10:15:13
CAM-4 yeah, they just moved a couple inches... cause you know, its nylon ya know, so.

10:15:20
CAM-2 (you throw some) numbers (in here)?

10:15:21
CAM-1 that's scare-... that's # scary-

10:15:24
CAM-1 without a lock (for those big heavy things / ** anything) man I don't like that.

10:15:27
CAM-1 I saw that, I was like #, I never heard of such a thing.

10:15:30
CAM-? * I'd be kinda interested ta ... wish I could put a camera down there and watch it.....

10:15:36
CAM-2 (you'd probably) # yourself.

10:15:37
CAM-1 right.

10:15:37
CAM-? see what they do.

10:15:39
CAM-1 those things are so # heavy you'd think though that they probably wouldn't hardly move no matter what.

TIME and
SOURCE

INTRA-COCKPIT COMMUNICATION
CONTENT

TIME and
SOURCE

AIR-GROUND COMMUNICATION

10:15:42
CAM-4 they always move.... everything moves. If it's not strapped -

10:15:46
CAM-1 no no - I-

10:15:48
CAM-4 it'll roll on them things [makes a 'motorized' sound]

10:15:51
CAM-1 [sound of laughter]

10:16:12
CAM [break in transcript]

10:16:17
CAM-2 ready to put some numbers in there?

10:16:17
CAM-1 yeah go ahead.

10:16:19
CAM-2 alright.... zero fuel weight is..... two fifty nine two

10:16:29
CAM-1 three oh seven three.

10:16:32
CAM-2 three oh seven two.

10:16:34
CAM-1 full T/O

10:16:36
CAM-2 full T/O, full climb.

10:16:37
CAM-1 one oh nine point three?

10:16:39
CAM-2 and that is.... one oh nine three. checks.

**TIME and
SOURCE**

**INTRA-COCKPIT COMMUNICATION
CONTENT**

10:16:44
CAM-1 flaps..... ten.
10:16:47
CAM-2 flaps ten.
10:16:49
CAM-1 (thousand feet for acceleration?)
10:16:53
CAM-2 yes sir.
10:17:01
CAM-1 fuel?
10:17:05
CAM-2 is..... thirty decimal four
10:17:08
CAM-1 three point eight?
10:17:10
CAM-2 three point seven, checks.
[break in transcript]

**TIME and
SOURCE**

AIR-GROUND COMMUNICATION

10:28:47

ATIS ...tower information victor 09:55 observation wind one zero zero at one seven, gust three zero. Sky condition eight thousand five hundred scattered, ceiling one four thousand broken, two zero thousand broken. Temperature one seven dewpoint six, altimeter two niner niner two. Runway three in use expect visual approach. * advisories taxiway charlie alpha closed. weather warnings moderate thunderstorms, high winds greater than or equal to thirty five less than forty five knots. hail greater than or equal to one quarter less than one half inch. weather watch * potential * five, weather advisories crosswinds observed greater than or equal to twenty knots. * *.

**TIME and
SOURCE**

**INTRA-COCKPIT COMMUNICATION
CONTENT**

10:41:21
CAM [break in transcript]
10:41:21
HOT-1 ok. starting four and three [engines 4 and 3]
10:41:23
CAM [sound similar to power interruption]
10:44:49
CAM [break in transcript]

10:45:01
HOT-1 * one F I think.

10:45:09
HOT-1 civilian callsign.

10:45:13
HOT-1 one zero-

**TIME and
SOURCE**

AIR-GROUND COMMUNICATION

10:28:48
RDO-2 "Yes sir ISAF [international security assistance force.....] nine five alpha quebec....."

10:44:52
RDO-2 Bagram ground ISAF nine five alpha quebec is ready to taxi.
10:44:56
GND nine five alpha quebec, taxi to runway three via juliet golf one, when able say civilian call sign.

10:45:04
RDO-2 ok understand uh runway three via golf uh juliet and golf one and uh, repeat the rest for -

10:45:10
RDO-2 oh. civilian callsign is november charlie romeo five-one zero two.

10:45:17
GND copy NCR one zero two

**TIME and
SOURCE**

**INTRA-COCKPIT COMMUNICATION
CONTENT**

10:45:21
CAM-2 I only knew that -

10:45:24
HOT-1 yeah let's do it.

10:45:47
HOT-1 got all that?

**TIME and
SOURCE**

AIR-GROUND COMMUNICATION

10:45:21
GND five alpha quebec, I have your clearance, advise when ready to copy.

10:45:25
RDO-2 ready to copy, for nine five alpha quebec.

10:45:32
GND nine five alpha quebec, cleared direct SIBLO via diverse vectors. on departure fly runway heading until three DME then turn left heading two one zero. climb and maintain two eight zero, squawk zero four seven three, departure frequency one two four point eight.

10:45:48
RDO-2 ok understand cleared to diverse vectors to SIBLO on takeoff runway heading to three DME, then right turn two one zero up to flight level two eight zero, squawk zero four seven three, on one two four decimal eight for departure ISAF nine five alpha quebec.

10:46:07
GND nine five alpha quebec that's a left turn two one zero, readback is correct, contact tower when ready.

10:46:13
RDO-2 kay left turn two one zero, for ISAF nine five alpha quebec.

**TIME and
SOURCE**

**INTRA-COCKPIT COMMUNICATION
CONTENT**

10:46:17
CAM-1 gotta setup somethin for your DME.
10:46:25
HOT-1 could just do, off uh....what can we put there-
10:46:30
HOT-2 I could do uh.... the airport.

10:46:40
CAM-1 let him go first.

10:46:56
CAM-1 works for me.
10:47:02
HOT-1 kay.
10:47:03
HOT-2 that one's right here in the middle.
10:47:06
CAM-? IBAG * * .

10:47:19
HOT-1 roger.

**TIME and
SOURCE**

AIR-GROUND COMMUNICATION

10:46:36
GND ISAF nine five alpha quebec give way to the C-17 off
your right he's taxiing juliet golf one.

10:46:40
RDO-2 roger we'll let him go first, for uh nine five alpha
quebec.

10:47:16
GND break ISAF nine five alpha quebec continue to follow
the C-17.

10:47:20
RDO-2 keep following the C-17 for nine five alpha quebec.

**TIME and
SOURCE**

**INTRA-COCKPIT COMMUNICATION
CONTENT**

**TIME and
SOURCE**

AIR-GROUND COMMUNICATION

10:47:26
HOT-1 those lights out?

10:47:29
HOT-1 [sound of laughter]

10:47:29
CAM-3 (sleepin) * *.

10:47:31
HOT-2 okay, turnoff lights are on.

10:47:38
HOT-1 all right, three hours, Tim.

10:47:39
CAM-5 good.

10:48:17
HOT-2 all right. for our takeoff departure review, be uh...I got one six seven, V1 one forty, runway heading is zero two seven up to flight level two eight zero, TOGA TOGA, VNAV, uh when I get up to three DME, have you put me on uh runway heading... actually before that, I'll have you- * right autopilot on command.

10:48:39
HOT-1 yeah * *.

10:48:40
HOT-1 ok.

10:48:41
HOT-2 and then I'll do a left turn to two one zero, up to two eight zero. T/O, full T/O one oh eight one.

10:48:55
HOT-2 I think it's good.

10:48:59
HOT-1 kay uh, let's go before takeoff checklist, to the line.

**TIME and
SOURCE**

**INTRA-COCKPIT COMMUNICATION
CONTENT**

**TIME and
SOURCE**

AIR-GROUND COMMUNICATION

| | |
|--------------------------|--|
| 10:49:02 HOT-2 | before takeoff checklist..... flaps? |
| 10:49:05 HOT-1 | ten (planned), ten checked. |
| 10:49:07 HOT-2 | flight controls? |
| 10:49:09 CAM-1 | check(ed). |
| 10:49:12 HOT-2 | takeoff departure review is complete, before takeoff checklist is complete to the line. |
| 10:49:23 HOT-2 | it's like- this air is just billowing outta here. |
| 10:49:26 HOT-1 | yeah what's that, what's- |
| 10:49:31 HOT-2 | you got some windshield air on over there? |
| 10:49:33 HOT-1 | I ain't got # on, man. |
| 10:49:39 HOT-1 | mine are all off. |
| 10:49:53 HOT-1 | how do we look on that wing, everything look clear? |
| 10:49:55 HOT-2 | everything's great. |
| 10:49:56 CAM-3 | @ [another company Captain] BBM'd, said what's up with the brake temps in Bagram. |

**TIME and
SOURCE**

**INTRA-COCKPIT COMMUNICATION
CONTENT**

**TIME and
SOURCE**

AIR-GROUND COMMUNICATION

10:49:60
HOT-1 [sound of chuckle] all normal.

10:50:06
HOT-2 said they're all zeros.

10:50:07
HOT-1 yeah. * what the # yer talking about.

10:50:010
CAM-3 * #.

10:50:11
HOT-1 did you actually talk to him?

10:50:12
CAM-3 no *. I don't talk to that # anymore.

10:50:13
HOT-1 [sound of laughter]

10:50:15
HOT-1 holding at the line?

10:50:16
HOT-2 holding at the line, sir.

10:50:18
HOT-1 ok you can go to tower.... set me up for departure... twenty four eight.

10:50:24
CAM-3 is @ [the second F/O] there? I haven't seen him. I hope he's in the bunk.

10:50:26
HOT-2 yeah that'd be better if he was.

10:50:29
HOT-1 he didn't get off.

10:50:31
HOT-2 no.

**TIME and
SOURCE**

**INTRA-COCKPIT COMMUNICATION
CONTENT**

10:50:39

CAM-3

yeah, he's in there. * *.

10:50:43

HOT-1

* # do a nose over, and put him through the ceiling.

10:50:47

HOT-2

yeah uh. him and those uh- those uh-

10:50:52

HOT-1

all right we'll be ready my man-

10:50:53

CAM-2

-MRAPs [mine resistant ambush protection vehicles]

10:51:53

CAM-2

* * we're waitin for that guy.

10:51:59

HOT-1

we all happy with that?

10:52:00

HOT-2

yeah, I'm good.

10:52:07

HOT-2

it's been uh - an hour and a half.

10:52:10

HOT-1

what's that?

**TIME and
SOURCE**

AIR-GROUND COMMUNICATION

10:51:01

RDO-2

tower ISAF nine five alpha quebec we'll be- is ready golf one, for departure runway three.

10:51:15

TWR

ISAF nine five alpha quebec, Bagram tower. roger, hold short.

10:51:18

RDO-2

hold short runway three ISAF nine five alpha quebec.

**TIME and
SOURCE**

**INTRA-COCKPIT COMMUNICATION
CONTENT**

**TIME and
SOURCE**

AIR-GROUND COMMUNICATION

10:52:11

HOT-2

it's been an hour and a half.

10:52:15

CAM-3

* sixteen off.

10:52:16

HOT-1

yeah. we're gonna-we're gonna beat it by about a half-by about a half hour. we're gonna need it.

10:52:24

HOT-2

half an hour or half a minute, its all the same.

10:52:27

HOT-1

that's right. we earned it. as far as I'm concerned man. I don't think - min rest, I'd be dead tomorrow man.

10:52:34

HOT-2

yeah. I think I think I would have to agree with that sentiment.

10:52:39

CAM-3

I'm dead right now.

10:52:41

HOT-1

so do you even tell crew scheduling -er do you just-

10:52:46

HOT-1

I mean.

10:52:47

CAM-3

see what they say * call em in the van on the way to the hotel.

10:52:51

HOT-2

what the hell's this guy doin?

10:52:53

CAM-3

see if they catch it.

**TIME and
SOURCE**

**INTRA-COCKPIT COMMUNICATION
CONTENT**

**TIME and
SOURCE**

AIR-GROUND COMMUNICATION

10:52:57
HOT-1 maybe-

10:52:57
CAM-3 you guys aren't leavin until seven Z anyways, so.

10:52:57
CAM-3 * might have to delay about a half hour.

10:53:04
HOT-2 S turns...

10:53:05
HOT-1 yeah it ain't a huge delay.

10:53:10
HOT-1 yeah, he like overshoot that, big time.

10:53:12
HOT-1 or-

10:53:14
HOT-2 maybe he was just-

10:53:18
CAM-3 I need a one in seven.

10:53:20
HOT-2 zero four zero at one zero. [in response to a wind
check provided by the TWR for a landing aircraft]...
is that what he just said?

10:53:23
HOT-1 yeah.

10:53:24
HOT-2 do you see a windsock out there?

10:53:28
HOT-1 no, I don't... what did he say?

10:53:30
HOT-2 zero four zero at one zero.

**TIME and
SOURCE**

**INTRA-COCKPIT COMMUNICATION
CONTENT**

**TIME and
SOURCE**

AIR-GROUND COMMUNICATION

| | |
|--------------------------|--|
| 10:53:32 HOT-1 | that's good. right down the runway. |
| 10:53:33 HOT-2 | yeah. |
| 10:53:40 HOT-2 | I'm not gonna go and- |
| 10:53:41 HOT-1 | hang on. |
| 10:53:43 HOT-? | (yeah). |
| 10:53:44 HOT-2 | I'm not gonna go barreling down the runway with... |
| 10:53:49 HOT-1 | ah *. |
| 10:53:49 HOT-2 | two units of [sound of chuckle] trim in. |
| 10:54:00 HOT-? | [sound of chuckle] |
| 10:54:00 HOT-2 | tryin to # buzz all these people on the road, or what. |
| 10:54:06 HOT-1 | some kinda tactical thing goin on here or- |
| 10:54:09 HOT-2 | I'm gonna put it on top of that *. |
| 10:54:14 HOT-2 | bet you can't get off at the first turnoff. |
| 10:54:15 HOT-1 | * * oh you know what, I'm sitting low, that's the problem. |

**TIME and
SOURCE**

**INTRA-COCKPIT COMMUNICATION
CONTENT**

10:54:28
HOT-1 final items.

10:54:29
CAM [sound of several clicks]

10:54:35
HOT-1 runway three is verified.

10:54:37
HOT-1 clear left.

10:54:38
HOT-2 prepare for departure.

10:54:41
HOT-2 kay.... cabin's notified. autothrottles are armed. I'm
in weather, you're in terrain, selected.

10:54:48
HOT-2 transponder TA/RA.

10:54:52
CAM-2 runway three.

10:54:53
CAM-1 verified.

10:54:55
HOT-2 verified runway three. before takeoff checklist
complete.

10:55:03
HOT-1 lineup and wait.

**TIME and
SOURCE**

AIR-GROUND COMMUNICATION

10:54:20
TWR ISAF nine five alpha quebec runway three, full
length, lineup and wait.

10:54:25
RDO-2 lineup and wait runway three, ISAF nine five alpha
quebec.

**TIME and
SOURCE**

**INTRA-COCKPIT COMMUNICATION
CONTENT**

10:55:04

HOT-2

lineup and wait.

10:55:10

HOT-2

tryin to make life exciting for all those guys there, I
guess.

10:55:44

HOT-1

cleared for takeoff.

10:55:45

HOT-2

clear for takeoff runway three.

10:55:52

HOT-1

got it.

10:56:03

HOT-2

stable.

10:56:05

HOT-2

thrust REF.

10:56:07

CAM

[sound similar to engines increasing speed]

10:56:15

HOT-1

zero one zero.

10:56:19

HOT-2

hold.

10:56:21

HOT-1

eighty knots, thrust set.

**TIME and
SOURCE**

AIR-GROUND COMMUNICATION

10:55:33

TWR

ISAF nine five alpha quebec runway three full length,
wind estimated zero one zero at one one gusting
one-[transmission interrupted]

10:55:47

RDO-2

clear for takeoff runway three, ISAF nine five alpha
quebec.

**TIME and
SOURCE**

**INTRA-COCKPIT COMMUNICATION
CONTENT**

**TIME and
SOURCE**

AIR-GROUND COMMUNICATION

| | |
|--------------------------|--|
| 10:56:22 HOT-2 | checks. |
| 10:56:34 HOT-1 | V1. |
| 10:56:35 AWS | V1. [from the Aural Voice Annunciation system] |
| 10:56:38 HOT-1 | rotate. |
| 10:56:44 HOT-1 | positive climb. |
| 10:56:45 HOT-2 | gear up. |
| 10:56:46 HOT-1 | keep on that (wing/weight/wait). |
| 10:56:47 CAM | [End of Recording, End of Transcript] |